

**Remarks**

The Examiner has objected to certain informalities in the drawings and specification, which have been corrected by the amendments thereto set forth above.

The Examiner has rejected claims 1-4, 6, 11-13, 15 and 17 under 35 U.S.C. §103(a) based on various combinations of references. Applicant submits that the rejections are not well founded for either one of the two following reasons:

- 1) The references, if combined, would not produce the claimed combination, and thereby do not present a *prima facie* case of obviousness; and
- 2) The motivation for combining the references is lacking because combining the references would produce a result that would defeat the objectives of the references and which would produce a combination that would not function as intended. One would, as a result, be motivated against consideration of adding the features of the secondary reference to the primary reference.

To demonstrate the above reasons, applicant has added new claim 22, which differs from claim 1 in the following respects:

*“a stationary peripheral ionization source configured to couple energy through the dielectric chamber wall in a ring-shaped distribution into the chamber, the peripheral ionization source including a low inductance RF antenna on the atmospheric side of the dielectric chamber wall and producing an annular magnetic field and a protective shield on the vacuum side of the dielectric chamber wall, the shield having slots therethrough and being configured to inhibit the deposition of material from the chamber onto the vacuum side of the dielectric chamber wall and to facilitate inductive coupling of RF energy from the antenna through the shield and in the ring-shaped distribution into the chamber; and*

*“the peripheral ionization source having a segmented configuration of alternating high and low-radiation segments arranged in a ring, the segments being positioned and configured to couple power through the dielectric chamber wall into the chamber in an annular alternating high and low power distribution to produce a stationary ring-shaped plasma of alternating high and low density in the chamber.”*

Applicant has also amended claim 11, as well as changed “sections” to “segments” when referring to sections of the segmented source, but retaining the word “sections” when referring to sections of the antenna or shield, thereby making the claim language easier to follow.

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The Examiner has rejected claims 1 and 17 under 35 U.S.C. §103(a) as unpatentable over either Drewery et al. U.S. Patent No. 6,287,435 or Brcka U.S. Patent No. 6,237,526 in view of Pu et al. U.S. Patent No. 6,825,618. Dependent claims were rejected over these references in further view of one or both of Davis et al. U.S. Patent No. 6,685,799 and Tdorov et al. U.S. Patent Pub. No. 2003/0006009. An obviousness-type double patenting rejection based Brcka U.S. Patent No. 6,237,526 in view of Pu et al. involves the same issue of obviousness as the 35 U.S.C. §103(a) rejections and is answered by the same argument below.

**No Prima Facie Case of Obviousness:**

The plasma source of the present invention produces a stationary ring-shaped plasma of alternating high and low density. This is illustrated in the three dimensional graphs in the application as an annular array of alternating high and low plasma concentrations. None of the applied references produces such a plasma distribution. The closest disclosure of this result is the distribution incidental to the source taught by applicant Brcka in his U.S. Patent No. 6,523,493 without the segmented source structure of the present invention.

The primary references that form the basis of the rejection, U.S. Patents Nos. 6,287,435 to Drewery et al. and 6,237,526 to Brcka, do not produce a ring-shaped plasma nor do they produce a plasma having alternating high and low density regions. They produce plasmas that tend to concentrate at the center of the chamber. Further, for a “peripheral ionization source”, either Brcka U.S. Patent No. 6,523,493, or the secondary Pu reference, is a more relevant example.

The secondary Pu reference is cited as showing a source having a segmented structure. But the Pu source does not produce a plasma distribution of alternating high and low density. To the contrary, Pu states:

“The invention can produce a plasma adjacent a semiconductor workpiece in a plasma chamber having excellent spatial uniformity, i.e., uniformity in both the radial dimension and the azimuthal dimension. The plasma has excellent radial uniformity because the adjacent sides of adjacent coils are approximately parallel. It has excellent azimuthal uniformity because the coils are equally spaced azimuthally relative to the geometric surface.” [Col. 2, lines 19-26.]

While the present invention produces uniformity adjacent the substrate, it does so while non-uniformly forming the plasma with the alternating low and high density areas for unique reasons

explained at length in the specification. Furthermore, Pu's source is made to rotate, which would eliminate the ability of any segmented source structure from having the effect of producing the alternating density plasma as sought by applicant. This rotation is a standard technique specifically intended to enhance plasma uniformity.

Furthermore, the Pu structure in which coils are formed by separate stacked windings surrounding magnetizable core material is designed to produce strong coupling but at the huge cost of increased inductance. This high inductance contributes to the high coil voltage that creates the need for the main aspect of the Pu invention, which is the manner that power is coupled to the leads of the coil to insure that the grounded side of the coil is always adjacent the dielectric window.

Applicant prevents this high voltage by creating a segmented source with an antenna having low impedance. This impedance is low relative to what it would be if the antenna were not segmented, as set forth in claim 11, as amended.

The features emphasized above are explicitly recited in new claim 22. The combination of references applied in the rejection do not produce these features or functions. Accordingly, it is submitted that no *prima facie* case of obviousness has been made as to claim 22 or the claims dependent thereon. Likewise, the features of the antenna that contribute to the relevant embodiments of the segmented source are not produced by the combined references. Accordingly, no *prima facie* case of obviousness is made as to amended claim 11 and the claims dependent thereon. Similarly, the application of the references to claims 11 and 22 make it easier to see that no *prima facie* case of obviousness is made as to claim 1, which has been amended to emphasize the functional difference between it and the prior art.

**Lack of Motivation to Combine References:**

The motivation for combining the primary references of Drewery or Brcka with Pu is lacking because combining the references in their entirety would produce a result that would defeat the objectives of the references and would not function as intended.

It is most apparent that Pu's rotating source mechanism would have to be disabled if the Pu source were to be used to produce the alternating density plasma that applicant's source provides. This would be inconsistent with Pu's objective of providing a uniform plasma.

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Furthermore, no one but applicant teaches the desirability of providing a plasma of alternating low and high density! This has been traditionally thought of as being highly undesirable, where it is considered an obstacle to the normally present goal of producing uniform plasma processing of the wafer.

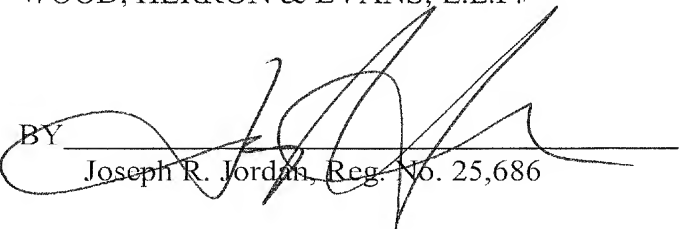
So even if it were possible to combine the references in such a way as to produce applicant's invention (and there is no suggestion as to how that would be done), there is no motivation to do so, but rather motivation against doing so.

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For the reasons stated above, it is submitted that the claims, as amended, are allowable. Accordingly, an early allowance is respectfully requested.

Respectfully submitted,

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